

RESEARCH ARTICLE

Internet Addiction Disorder and its Associated Factors among 15-19-Year Adolescents in Colombo District, Sri Lanka

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Internet Addiction Disorder		
Internet addiction disorder is growing as a potentially problematic condition parallel to existing behavioral disorders, especially among adolescents.		
The objective of this study was to determine its prevalence and associated factors among 15-19-year-old adolescents in Colombo district, Sri Lanka.	The prevalence of Internet addiction disorder and its associated factors were determined.	The prevalence of Internet addiction disorder among 15- to 19-year-old adolescents in Colombo district was 17.2% (95% CI: 15.2-19.3).
Male sex, excessive use of social media, lack of engagement in outdoor sports, unemployed mother, excessive engagement in internet gaming, excessive internet usage time per day for non-academic activities, and higher duration of internet use in years were the statistically significant associated factors of Internet addiction disorder among 15-19-year-old adolescents in Colombo district.		

Highlights

- The prevalence of Internet addiction disorder among adolescents (15 – 19 years) in Colombo district was 17.2%.
- It is comparable with the published local and regional estimates.
- The multivariate logistic regression model included seven independent variables and it adequately fits the data ($\chi^2=5.309$).
- 59.4% of the data was correctly predicted by the new model.

RESEARCH ARTICLE

Internet Addiction Disorder and its Associated Factors among 15-19-Year Adolescents in Colombo District, Sri Lanka

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Abstract: Internet addiction disorder (IAD) is growing as a potentially problematic condition parallel to existing behavioral disorders, especially among adolescents. Nonetheless, the condition is widespread and problematic, limited scientific evidence is available on the prevalence, diagnosis, risk factors, prevention, and efficacy of the treatment globally as well as locally. The objective of this study was to determine the prevalence and associated factors of Internet addiction disorder among 15-19-year-old adolescents in Colombo district, Sri Lanka. Internet Addiction Test (IAT) was adapted, translated, and validated for this study. A school-based descriptive cross-sectional study was conducted among 1,351 school-going adolescents using the multi-stage stratified cluster sampling method. A self-administered questionnaire was used for the data collection and the data analysis was done using the SPSS-21 version. Initial bivariate analysis was followed up with Multivariate Logistic Regression analysis to determine the associated factors of Internet addiction disorder. The prevalence of Internet addiction disorder among adolescents was 17.2% (95% Confidence Interval, CI: 15.2-19.3). Sex (Adjusted Odds Ratio, AOR=2.27; 95% CI: 1.27-4.07), excessive use of social media (AOR=4.32; 95% CI: 2.12-8.80), lack of engagement in outdoor sports (AOR=5.4; 95% CI: 2.49-11.73), unemployed mother (AOR=2.06; 95% CI: 1.40-3.04), excessive engagement of internet gaming (AOR=1.94; 95% CI: 1.34-2.82), excessive internet usage time per day for nonacademic activities (AOR=2.59; 95% CI: 1.71-3.91), higher duration of internet use in years (AOR=2.64; 95% CI: 1.80-3.85), and no excessive internet use by the parents (AOR=0.46; 95% CI: 0.30-0.70) were the statistically significant associated factors. The prevalence of Internet addiction disorder among adolescents was within the range. The findings will aid the policymakers and administrators in the prevention, diagnosis, and management of Internet addiction disorder among this age group of adolescents.

Keywords: adolescent; associated factors; Internet addiction; prevention of Internet addiction; school-based

INTRODUCTION

The Internet has become a significant component of contemporary life for all age groups. People have increasingly adopted and used the internet for entertainment, socialization, and information retrieval. Easier access to smartphones and higher utilization of laptops provided people to use the internet freely. Although the positive aspects of the internet have been readily praised, there is

a growing amount of literature on the negative side of its excessive and pathological use. Internet addiction disorder is defined as a psychological dependence on the Internet, regardless of the type of activity once logged on (Kandell, 1998). The condition was also described as an impulse control disorder that results in personal, professional, educational, and financial conflicts with life relationships being affected (Shaw & Black, 2008). Even though Internet addiction disorder has emerged as a universal issue, its international prevalence estimates vary vastly. A study reported a global prevalence of 6.0% (95% CI 5.1-6.9) in its analysis (Cheng & Li, 2014). A descriptive review revealed the worldwide prevalence of the disorder could vary from 0.3% to 38% (Chakraborty *et al.*, 2010). There were limited estimates on Internet addiction disorder in Sri Lanka. A prevalence study revealed 27.6% of University students in Sri Lanka have the disorder (Rodrigo *et al.*, 2012).

Worldwide, there are variations in prevalence data on Internet addiction disorder among adolescents. In Europe and the United States of America, rates ranged from 7.9 to 25.2% while in the Middle East and Africa rates from 17.3 to 23.6% among adolescents by 2014. Studies in Asia have revealed a higher variation in prevalence among young people and adolescents, ranging from 8.1 to 50.9% (Cheng *et al.*, 2014). There are many negative consequences of Internet addiction disorder that have been reported including a variety of detrimental outcomes for adolescents that may require professional intervention.

Researchers believe that Internet addiction disorder may manifest the same troubling effects as substance abuse among adolescents. It can be characterized as various physical and psychological problems and mostly manifests in adolescents as low educational performance, lack of motivation, social withdrawal, and loneliness (Chung *et al.*, 2019). Internet addiction disorder is one of the fast-growing addictive behaviors and is a significant public health problem affecting a large number of adolescents worldwide. Therefore, the preventive strategies should be geared towards addressing the associated factors. Research reported that male gender, having a personal device, time

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of internet use, using smartphones, permanent login status, chatting through the internet, making online friends, online shopping, watching films, online gaming, searching information online, and messaging have been found to be significantly associated with the Internet addiction disorder (Anusha *et al.*, 2016). The duration of internet use, having higher levels of depression, compulsivity, aggressiveness, lower family cohesion, higher accessibility to internet cafes, and higher exposure to internet gaming was associated significantly with the disorder (Chung *et al.*, 2019).

A study reported social networking, chatting, downloading media files, and pornography as associated factors (Goel *et al.*, 2013). Despite many countries sharing the public health impact of Internet addiction disorder, much is not known about its associated factors among Sri Lankan adolescents. The objective of this research was to determine the prevalence of Internet addiction disorder and its associated factors among 15-19-year-old adolescents in Colombo district.

MATERIALS AND METHODS

The study was a descriptive cross-sectional study including an analytical component to determine the prevalence of Internet addiction disorder by using the validated tool (IAT) and to describe the associated factors of Internet addiction disorder. Before the prevalence study, the Internet Addiction Test (IAT) was adapted, translated, and validated into Sinhala and Tamil languages resulting IAT-Sinhala and IAT-Tamil versions by conducting two descriptive cross-sectional validation studies. The developed tools were intended to assess Internet addiction disorder among 15-19-year-old adolescents in the Colombo district. In validation studies, statistical analysis was carried out by using SPSS-21 (Principal Component Analysis) and LISREL 8.8 (Confirmatory Factor Analysis). The reliability was assessed by internal consistency and test-retest reliability methods. The study was carried out in government schools having grades 10 to grade 13 in Colombo district, Sri Lanka from October 2019 to July 2021. The data collection was completed in February and March 2021. Multi-stage stratified cluster sampling method was used as the sampling Method.

The cluster size was selected by considering the median number of students in a class according to the school health statistics of Colombo district since the number of students in each class has a skewed distribution. The number of students in each class varied from 10 to 43 in all the schools.

The minimum possible cluster size has been considered for the internally heterogeneous groupings and maximum cluster numbers and the cluster size was considered as 22. The final sample size was 1327 and Internet Addiction Test was applied to detect Internet addiction disorder. The scale consists of 20 items with a six-point Likert scale with a range of 0 to 5. The total range of the questionnaire was 0 to 100 and the sum of the scores for all the items of an individual was considered as the total score and higher scores indicated higher levels of addiction. Total Internet Addiction Test scores of an individual exceeding one standard deviation above the mean score were considered

as the cut-off for having Internet addiction disorder. The value was calculated using the total IAT scores of the cross-sectional validation study.

Data entry was done by the principal investigator and all the questionnaires were inspected for their completeness. The datasheet was rechecked for missing values and other inconsistencies. All the gathered data were manually cleaned and checked before entering the statistical package of social sciences (SPSS version 21). The prevalence of Internet addiction disorder among 15-19-year-old adolescents in Colombo district was determined as a probability with a 95% confidence interval. Multivariate analysis was used to investigate the significant variables that have an impact on Internet addiction disorder. It was carried out to identify adjusted odds ratios of associated factors of Internet addiction disorder. Internet addiction disorder (having the disorder/not having the disorder) was the dichotomous outcome variable (dependent variable).

The multivariate logistic regression method was used as a mathematical model that can provide an adjusted odds ratio that has controlled for multiple confounders. Variables observed with a p-value less than 0.1 in univariate analysis were included in the multivariate analysis and the backward elimination technique was used. It has been assured that all pertinent and potentially predictive variables were studied and included.

The Hosmer-Lemeshow test was used to determine the goodness of fit of the logistic regression model. The administrative permission for the study was obtained from the Ministry of Health and the Ministry of Education. Informed written consent was taken from the parents and the adolescents who were involved in the study. Informed verbal consent was requested from all the principals and teachers in relevant schools before the data collection. The objectives and aims were explained with information sheets in simple language. Confidentiality was assured throughout. The findings of the study were planned to be communicated through a report to the Family Health Bureau(FHB), Provincial Directorate of Health Services (PDHS)-Western Province, Regional Directorate of Health Services(RDHS)- Colombo, and Provincial Ministry of Education-Western province. There was no conflict of interest. Ethical clearance for the study was by the Ethics review committee of the Faculty of Medicine, Colombo.

RESULTS

Prevalence of Internet addiction disorder among 15-19-year-old adolescents in Colombo district

The sample was collected from 1380 study participants. The response rate was 99% and 15 questionnaires (1.1%) were removed due to incomplete entries. The final sample size was 1351 including 15-19-year-old adolescents of both genders, which exceeded the calculated sample size determined in the methodology (Table 1).

The highest proportion of adolescents was in the age group of 16 years ($n=573, 42.7\%$) and the lowest proportion was in the 18-year-old age group ($n=231, 17.2\%$). The mean age was 16.3 years ($SD=0.96$). A total of 687 adolescents in the

Table 1: Frequency distribution of the study participants by age and sex.

Characteristic	Number	Percentage
Age of the study participants		
15	292	21.8
16	573	42.7
17	246	18.3
18	231	17.2
Total	1342	100
	Mean=16.3	SD=0.96
Sex of the study participants		
Female	664	49.1
Male	687	50.9
Total	1351	100

study sample were males (50.9%) and 49.1% were females (n=664).

Internet Addiction Test (IAT) scores of the study participants

The mean score value for the Internet Addiction Test (IAT) total score was 27.75 with a median of 24. The skewness was 0.792 and the kurtosis was 0.202 indicating normal distribution (Table 2)

Table 2: Descriptive statistics of Internet Addiction Test (IAT) scores of study participants.

Descriptive statistics	Value
Mean	27.75 (95% CI: 26.73-28.75)
Median	24
Mode	22
Range	83
Skewness	0.792
Kurtosis	0.202

Assessment of the Prevalence of Internet addiction disorder among 15–19-year-old adolescents in Colombo District

There were 17.2% (95% CI: 15.2-19.3) of adolescents with Internet addiction disorder and 82.8% (95% CI: 80.7% - 84.8%) of adolescents without having the disorder (Table 3).

Multivariate logistic regression model with selected associated factors for Internet addiction disorder among 15–19-year-old adolescents in Colombo district

There were seven independent variables were retained in the model. The Hosmer-Lemeshow test indicated that the model adequately fits the data and supported the model ($\chi^2=5.309$; $df= 07$; $p=0.724$). Furthermore, 59.4% of the data was correctly predicted by the new model (Table 4)

DISCUSSION

The prevalence of Internet Addiction Disorder among adolescents was 17.2% (95% CI:15.2-19.3). Male sex (AOR=2.27; 95% CI:1.27-4.07), excessive use of social media (AOR=4.32; 95% CI:2.12-8.80), lack of engagement in outdoor sports (AOR=5.4; 95% CI:2.49-11.73), unemployed mother (AOR=2.06; 95% CI:1.40-3.04), excessive engagement of Internet gaming (AOR=1.94; 95% CI:1.34-2.82), excessive Internet usage time per day for non-academic activities (AOR=2.59; 95% CI:1.71-3.91), and higher duration of internet use in years (AOR=2.64; 95% CI:1.80-3.85) were the statistically significant associated factors.

Among the associated factors of Internet addiction disorder, the male sex emerged as a significant predictor in the multivariable analysis. The findings corroborate with many previous studies stating that addiction is more common in males than in females. According to the present study, being a male (AOR=2.27;95%CI:1.27-4.07) has increased the odds of having Internet addiction disorder.

Table 3: Levels of Internet addiction disorder among 15–19-year-old adolescents in Colombo district.

Internet Addiction Disorder (IAD)	Frequency	Percentage	95% CI
Adolescents with IAD	233	17.2	15.2-19.3
Adolescents without IAD	1,118	82.8	80.7-84.8
Total	1,351	100	

Table 4: Multivariate logistic regression model with selected associated factors for Internet addiction disorder among 15–19-year-old adolescents in Colombo district.

Factor	Sig	Exp(B)	95% CI for Exp(B)
Excessive attachment to social media	0.001	4.32	2.12- 8.80
Lack of engagement in outdoor sports	0.001	5.40	2.49-11.73
Non-employed mother	0.001	2.06	1.40-3.04
Excessive attachment to Internet gaming	0.001	1.94	1.34-2.82
Male sex	0.001	2.27	1.27-4.07
Using the Internet for nonacademic activities	0.001	2.59	1.71-3.91
Higher duration of Internet use in years	0.001	2.64	1.80-3.85

Since this figure has been consistent throughout, the finding may be possibly due to the male adolescents who are generally more passionate about knowing the unknown facts or exploring new inventions or they are usually more attracted to addictive objects such as pornography, cybersex, and online gaming compared with the female. They also have more freedom than females to engage in online activities. A cross-sectional study conducted among Greek adolescents with a mean age of 14.7 years reported male gender was having higher levels of Internet addiction disorder (OR:2.01, 95% CI:1.35-3.00) (Kormas *et al.*, 2011). Another study revealed similar results (AOR 1.69, 95% CI:1.081- 2.65, $p = 0.021$) where the findings were very much consistent with the present study (Krishnamurthy and Chetlapalli, 2015).

Among the local studies, one prevalence study reported that there was a male preponderance to have addiction in undergraduates at the University of Sri Jayawardenepura (<0.05) (Sachitra, 2015). It has been known that adolescent boys utilize the internet more frequently and extensively than adolescent girls. These gender differences observed could be attributed to the potential confounding effect of the differences in the frequency of internet utilization between genders. Excessive social media can lead to an uncontrollable urge to log on and devote so much time and effort to the users. Behavioral models explain excessive use of social media can be viewed as one form of an Internet addiction disorder, where individuals exhibit a compulsion to use it (Griffiths *et al.*, 2016).

According to the current study excessive use of social media has increased the odds of having Internet addiction disorder (AOR=4.32, 95% CI:2.12-8.80, $p=0.001$). This finding of the study has been persistent throughout. Hassan *et al.* (2020) concluded that spending time on social media websites was the most common online activity among adolescents ($p<0.05$). Guedes *et al.* (2016) revealed that the increased prevalence of social media usage has become addictive among the youth ($p<0.001$). However, in the above-mentioned studies, an association between Internet addiction disorder and social media use has not been reported as Odds ratios compared to the present study where the odds ratio was computed to quantify the strength of the association. This alarming statistic of the current study sheds light on policy implications. Program planners in the education and health sectors could consider the possibility of students being addicted to social media usage and educate students about the negative consequences of such addictive behavior. Multivariate logistic regression analysis revealed that lack of engagement in outdoor sports among adolescents was more likely to have Internet addiction disorder (AOR=5.40, 95% CI: 2.49-11.73, $p=0.001$). A study reported that exercise and sports can significantly reduce the levels of internet addiction disorder (<0.05) and elaborated Internet addiction disorder leads to changes in neural structure, decreases the activity of the dopaminergic system, and limits neurocognitive function which can be reversed by an exercise-based intervention (Li *et al.* 2020). The other possible explanation is that outdoor sports and exercise can substantially reduce the time spent online and make adolescents physically active. A cross-sectional study

carried out on the effect of gender and physical Activity on Internet addiction disorder among medical undergraduates in the army medical college, Rawalpindi in 2015 reported that the total score and frequency of Internet addiction disorder diagnosed by IAT were higher in students lacking physical activity as compared to those with regular physical activity ($p=0.01$) (Khan *et al.*, 2017).

However, an association between Internet addiction disorder and engagement in outdoor sports among adolescents has not been reported as Odds ratios compared with the present study. Students who take part in any kind of physical activity outdoors tend to stay away from gadgets that use the internet. They are more inclined towards healthy activities instead of spending time on the internet. They tend to sleep early because of physical tiredness, so the chances of internet usage till late at night are rare in these students. On the other hand, students who do not participate in physical activities are lazy and remain stuck with internet devices. Unemployment of the mother was reported to have higher levels of Internet addiction disorder among the 15–19-year-old adolescents in multivariate logistic regression analysis (AOR=2.06, 95% CI:1.40-3.04, $p=0.001$). This was an unexpected finding in the present study contradicting the previous research. Despite that, the association between parental depression and adolescent Internet addiction in South Korea has been investigated and found that there are strong positive associations between Internet addiction disorder and high maternal education level ($p<0.05$) which again contradicts the finding of the current study (Choi *et al.* 2018). Studies show that maternal unemployment is associated with low life satisfaction in adolescents (Johansson *et al.*, 2019).

It is unclear whether this translates to an association between unemployment and Internet addiction disorder among adolescents in the present study. It is debatable that children and adolescents are wholly mediated by the situation within the family and if the mother is unemployed, she has to be with her children most of the time and Internet addiction disorder among the children should be less. However, Maternal unemployment can also be associated with low-income levels in families, and they may generally have lower educational achievements. Mothers in such families may not be aware of the adverse effects of Internet addiction and possibly not supervise the use of the Internet by their children, which may lead to overuse and addiction.

Excessive engagement in internet gaming was reported to have higher levels of Internet addiction disorder among 15–19-year-old adolescents in multivariate logistic regression analysis (AOR=1.94; 95% CI:1.34-2.82). Internet gaming is an emerging issue for adolescents as well as their parents which was increasingly discussed over the last decade. Excessive online video gaming is considered to be associated with addictive behaviour that often leads to significant daily, work, and educational disruptions among adolescents. Several studies have similar findings which support the current study result. A cross-sectional study conducted among Greek adolescents using IAT reported that internet gaming has been positively associated with Internet addiction disorder (AOR: 1.85; 95% CI: 1.21-2.82)

(Kormas et al. 2011).

Association between internet gaming and Internet addiction disorder was further investigated among 14-17-year-old adolescents in seven European countries and reported to have a positive association between Multiplayer role-playing games and Internet addiction disorder (AOR=1.82 95%CI= 1.63–2.04) (Tsitsika et al., 2014). Factors associated with Internet addiction among Tunisian adolescents have been investigated in 2019 and reported to have a strong association between Internet gaming frequency and Internet addiction disorder (AOR=3.28, $p=0.002$) (Thabet et al. 2019).

The excessive average daily hours spent online for non-academic activities among adolescents were reported to have higher levels of addiction (AOR=2.59, 95% CI: 1.71–3.91, $p=0.001$). Considering the available literature, similar association patterns have been often identified. A study conducted on the prevalence and associated factors of internet addiction among young adults in Bangladesh reported excessive time spent daily online was having higher levels of Internet addiction disorder ($p<0.01$) (Hassan et al., 2020). Rodgers et al. (2013) revealed higher levels of Internet addiction disorder among participants who spent more weekly online hours.

The total duration of internet use in years among adolescents was reported to have higher levels of Internet addiction disorder in multivariate logistic regression analysis (AOR=2.64; 95% CI: 1.80–3.85). Hassan et al. (2020) reported a statistically significant relationship between the duration of internet use and Internet addiction disorder ($\chi^2=7.366$, $p=0.03$), and if the duration was less than 6 months that reduce the level of Internet addiction disorder (AOR=0.622, 95% CI: 0.14–3.21).

Therefore, increased online engagement for a longer duration can be significantly associated with Internet addiction disorder. This is also reflecting the early initiation of internet activities in early adolescents which need to be controlled by the parents.

CONCLUSIONS

The prevalence of Internet addiction disorder among 15- to 19-year-old adolescents in Colombo district was 17.2% (95%CI: 15.2–19.3) and the current prevalence of Internet addiction disorder among the 15- to 19-year-old adolescents in Colombo district is comparable with the published local and regional estimates. The prevalence was assessed in a random and adequate sample of adolescents using the validated IAT with a scientifically determined cut-off point. The multivariate logistic regression model included seven independent variables and the model adequately fits the data ($\chi^2=5.309$; $df=07$; $p=0.724$) and 59.4% of the data was correctly predicted by the new model. Male sex, excessive use of social media, lack of engagement in outdoor sports, unemployed mother, excessive engagement of internet gaming, excessive internet usage time per day for non-academic activities, and higher duration of internet use in years were identified as statistically significant associated factors of Internet addiction disorder among

15-19-year-old adolescents in Colombo district. This study focused on 15-19-year-old school-going adolescents in the Colombo district to study Internet Addiction Disorder (IAD) prevalence and associated factors. However, the findings are limited in generalizability because non-school-going adolescents and those in paying schools were not included. It employed a cross-sectional design, meaning it didn't assess the temporal relationship between IAD and its associated factors. School-based prevention programs can be developed based on these results, increasing awareness of IAD's seriousness amid the growing use of digital technology in education. Understanding IAD and its factors is vital for planning effective prevention strategies. Additionally, local context-specific data on IAD are essential for tailoring public health programs, given cultural variations in policies. The study suggests future research to explore IAD prevalence and factors across diverse populations and interventions in community and school settings.

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DECLARATION OF CONFLICT OF INTEREST

The authors declare that they have no competing financial or any other interests that could have appeared to influence the work reported in this article.

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